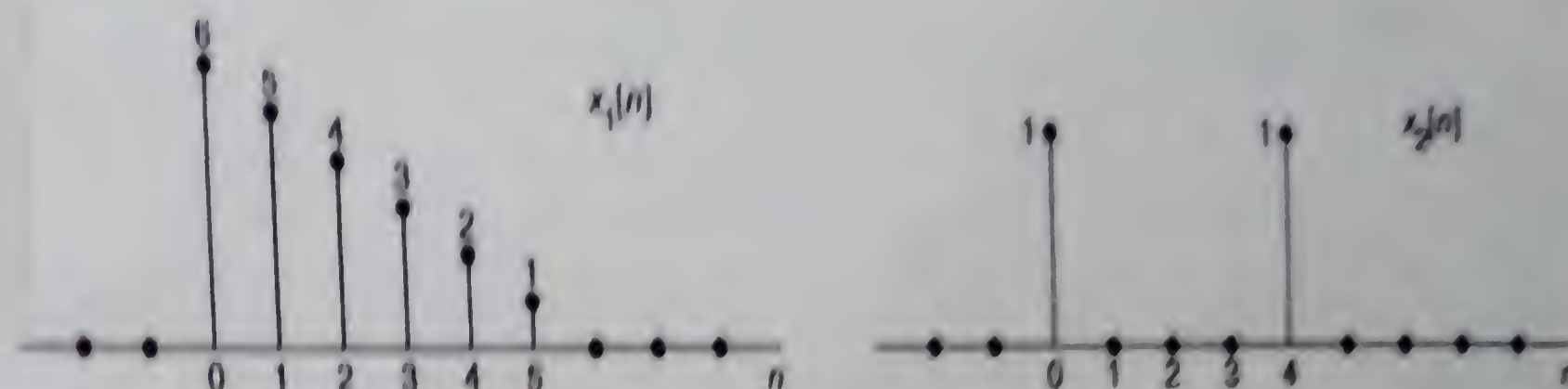


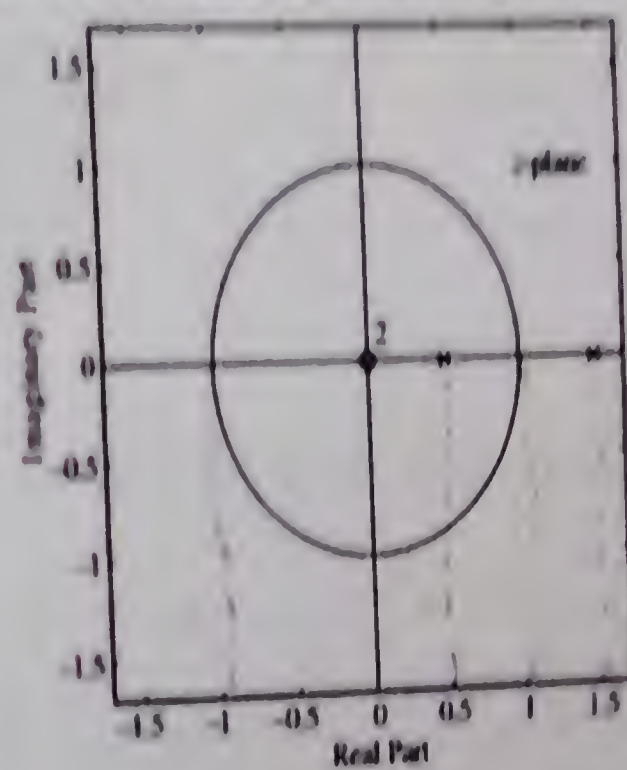
Q1. [30 marks]

Sketch $x_1[n]$ and $x_2[n]$



Q2. [35 marks]

A DSP system has the following zero-pole diagram
Find its impulse response for a stable system



$K=3$

Q3. [35 marks]

Find the inverse $h[n]$ of the following system (if it is invertible). If not, why not?

$$\left\{ \left(\frac{1}{2}\right)^n u[n] + (2)^n u[-n-1] \right\} \quad \text{ROC} \rightarrow \frac{1}{2} < |z| < 2$$

$$H(z) = \frac{z}{z - \frac{1}{2}} + \left(-\frac{z}{z-2}\right) = \frac{z^2 - 2z - (z^2 - \frac{1}{2}z)}{z^2 - 2.5z + 1}$$

$$= \frac{-1.5z}{z^2 - 2.5z + 1}$$

$$H(z)_{\text{INV}} = \frac{z^2 - 2.5z + 1}{-1.5z} = -\frac{1}{1.5}z + \frac{2.5}{1.5} - \frac{1}{1.5}z^{-1}$$

$$\therefore h[n]_{\text{INV}} = -\frac{1}{1.5}(\delta[n+1]) + \frac{2.5}{1.5}\delta[n] - \frac{1}{1.5}(\delta[n-1])$$

$$= \left\{ -\frac{1}{1.5} \quad \frac{2.5}{1.5} \quad -\frac{1}{1.5} \right\}$$